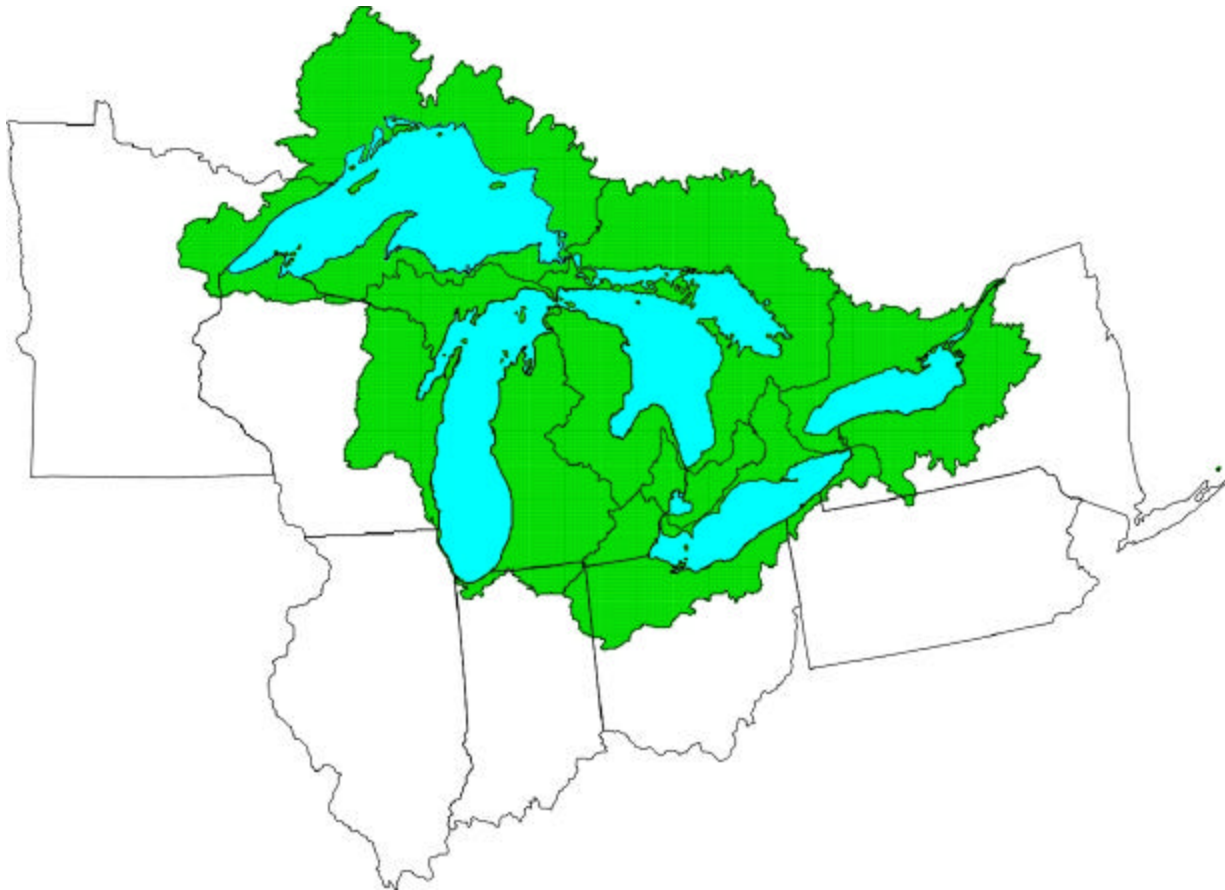


# Improvements to the Great Lakes – St. Lawrence River Biohydrological Information Base

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In response to Public Law 106-53, Water Resources Development Act of 1999,  
Section 455(b), John Glenn Great Lakes Basin Program,  
Great Lakes Biohydrological Information

## Appendix L: Project Background



April 2005



US Army Corps  
of Engineers®

# Measurement Converter Table

## U.S. to Metric

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### **Length**

feet x 0.305 = meters

miles x 1.6 = kilometers

### **Volume**

cubic feet x 0.03 = cubic meters

gallons x 3.8 = liters

### **Area**

square miles x 2.6 = square kilometers

### **Mass**

pounds x 0.45 = kilograms

## Metric to U.S.

---

### **Length**

meter x 3.28 = feet

kilometers x 0.6 = miles

### **Volume**

cubic meters x 35.3 = cubic feet

liters x 0.26 = gallons

### **Area**

square kilometers x 0.4 = square miles

### **Mass**

kilograms x 2.2 = pounds

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ACWI – Advisory Committee on Water Information  
AHPS – Advance Hydrologic Prediction System  
ARA – Agroecological Resource Area  
ASOS – Automated Surface Observing System  
AWS – Air Weather Service  
AWUDS – Aggregate Water-Use Data System  
CanSIS – Canadian Soil Information System  
CCAP – Coastal Change Analysis Program  
CCOG – Canadian Council on Geomatics  
CGDI – Canadian Geospatial Data Infrastructure  
CIR – color infrared  
CLI – Canada Land Inventory  
C-MAN – Coastal Marine Automated Network  
CTM – Cooperative Topographic Mapping  
DCP – Data Collection Platform  
DEC – Department of Environmental Conservation  
DEQ – Department of Environmental Equality  
DEM – Digital Elevation Model  
DFO – Fisheries and Oceans Canada  
DNR – Department of Natural Resources  
DOC – Department of Commerce  
DOD – Department of Defense  
DOT – Department of Transportation  
EIA – Energy Information Administration  
ESS – Natural Resources Canada Earth Sciences Sector  
FAA – Federal Aviation Administration  
FEMA – Federal Management Agency  
FERC – Federal Energy Regulatory Commission  
FGDC – Federal Geographic Data Committee  
FIPS – Federal Information Processing and Standards  
FRIS – Farm and Ranch Irrigation Survey  
FSA – Farm Services Agency  
GAP – Great Lakes Aquatic Gap Analysis Program  
GCGI – Minnesota's Governor's Council on Geographic Information  
GCM – Global Change Model  
GIS – Geological Information System  
GLC – Great Lakes Commission  
GLERL – Great Lakes Environmental Research Laboratory  
GLSW- Great Lakes Surface Water  
GPR – ground-penetrating radar  
GPS – Global Positioning System  
GSC – Geological Survey of Canada  
GTS – Global Telecommunication System  
GW – Groundwater  
GWSI – Ground-Water-Site-Inventory  
HUC – hydrologic unit code  
IACG – Inter-Agency Committee on Geomatics  
ICMA – International City/County Management Association  
IFIM – Instream Flow Incremental Methodology



IJC – International Joint Commission  
 ILGIC – Illinois Geographic Information Council  
 INGISI – Indiana GIS Initiative  
 LIO – Land Information Ontario  
 LMIC – Land Management Information Center  
 LOSL – Lake Ontario-St. Lawrence River Study  
 LPDB – Land Potential Data Base  
 LRS – Land Remote Sensing  
 MCGI – Michigan Center for Geographic Information  
 MGF – Michigan Geographic Framework  
 MGFN – Michigan Geographic Framework Network  
 MNFI – Michigan Natural Features Inventory  
 MOE – Ministry of Environment  
 MRCC – Midwestern Regional Climate Center  
 MSC – Meteorological Service of Canada  
 MUD – Environment Canada's Municipal Water Use Database  
 NAICS – North American Industry Classification System  
 NASA – National Aeronautics and Space Administration  
 NASIS – National Soil Information System  
 NAWQA – National Water Quality Assessment Program  
 NCDC – National Climatic Data Center  
 NCGC – National Cartography and Geospatial Center  
 NCGMP – National Cooperative Geologic Mapping Program  
 NCSS – National Cooperative Soil Survey  
 NEXRAD – Next Generation Weather Radar System  
 NLCD – National Land Cover Dataset  
 NPS – National Park Services  
 NOAA – National Oceanic Atmospheric Administration  
 NOEGTS – Northern Ontario Engineering Geology Terrain Studies  
 NDBC – National Data Buoy Center  
 NIST – National Institute of Standards and Technology  
 NRCC – Northeastern Regional Climate Center  
 NRCS – Natural Resources Conservation Service  
 NRI – National Resource Inventory  
 NSDB – National Soil Database  
 NSDI – National Spatial Data Infrastructure  
 NSFIC – National States Geographic Information Council  
 NSIP – National Streamflow Information Program  
 NWIS – National Water Information System  
 NWRI – National Water Research Institute  
 NWS – National Weather Service  
 NWUIP – National Water-Use Information Program  
 NWUDS – National Water-Use Data System  
 OGDE – Ontario Geospatial Data Exchange  
 OGRIP – Ohio Geographically Referenced Information Program  
 OGS – Ontario Geological Survey  
 OHRSC – Operational Hydrologic Remote Sensing Center  
 OLID – Ontario Land Information Directory  
 OLIW – Ontario Land Information Warehouse  
 OMAF – Ontario Ministry of Agriculture and Food  
 OMB – Office of Management and Budget

OMNR – Ontario Ministry of Natural Resources  
OSW – Other Surface Water  
PAGIC – Pennsylvania Geospatial Information Council  
PASDA – Pennsylvania Spatial Data Access  
PCS – Permit Compliance System  
RASA – Regional Aquifer-System Analysis  
RD – Rural Development  
RSA – Remote Sensing Analysis  
SCAN – Soil Climate Analysis Network  
SDWIS – Safe Drinking Water Information System  
SIC – U.S. Standard Industrial Classification  
SLC – Soil Landscapes of Canada  
SOLEC – State of Lakes Ecosystem Conference  
SSURGO – Soil Survey Geographic database  
STATSGO – State Soil Geographic database  
TMDL – total maximum daily load  
USAD – U.S. Department of Agriculture  
USCG – U.S. Coast Guard  
USEPA – U.S. Environmental Protection Agency  
USFWS – U.S. Fish and Wildlife Service  
USGS – U.S. Geological Survey  
WAM – Wave Prediction Model  
WIS – Wave Information Studies  
WISCLAND – Wisconsin Initiative for Statewide Cooperation for Land Cover Analysis and Data  
WLIB – Wisconsin Land Information Board  
WLIP – Wisconsin Land Information Program  
WRMC – Water Resources Management Committee  
WRMDSS – Water Resources Management Decision Support System  
WSR-88 Radar – Weather Surveillance Radar-1988 Doppler Network

## List of Essential Questions

### Category 1: Basic Information on Water Withdrawal

The first category of questions covers basic information on the water withdrawal, such as the characteristics of the source and return water bodies, the proposed use of the water, and information related to the structure and operation. These questions also address alternatives to the proposed withdrawal, and the associated impacts.

#### 1. Where is the proposed water withdrawal?

*If water withdrawal is from a Great Lake, St. Lawrence River, or Connecting Channel:*

- What is the specific location and depth of withdrawal?
- What are the relevant hydrology, geometry, hydrodynamics, and water quality in the vicinity of the withdrawal?

*If water withdrawal is from a river:*

- Where is it located on the river?
- What are the statistics on flow regime (average flow, 7Q10, 100 year flow)?
- What are the key characteristics of the river and watershed? Characterize sub-watersheds by land use types.

*If water withdrawal is from an inland lake:*

- What are the inflows and outflows?
- What is the lake geometry?
- What is range of water levels?
- What is hydraulic retention time?

*If water withdrawal is from a groundwater source:*

- What is the elevation of the water table?
- What is the size of the aquifer?
- What is the general characterization of the aquifer?
- What is the estimated sustained yield of the aquifer?
- How does this aquifer relate to the surface waters of the Great Lakes basin?

#### 2. What is the existing quality of the source water and sediments?

- |                            |                               |
|----------------------------|-------------------------------|
| • Temperature              | • Nitrates                    |
| • Dissolved oxygen         | • Buffering capacity          |
| • BOD                      | • Salinity                    |
| • Total dissolved solids   | • Sulfur                      |
| • Pathogens                | • Water conductivity          |
| • Dissolved organic carbon | • Persistent Toxic Substances |

#### 3. Describe the current assimilative capacity of the source and return water.

#### 4. Describe the key habitat characteristics for habitats associated with the source or receiving water (i.e., quality, access, resilience)

- Are there endangered or threatened species or fragile habitats associated with the source water? If so, list and describe.
- Does the area of influence contain a significant amount of seasonal/semipermanent wetlands, bogs or fens that are directly linked to the water table? If so, describe.

#### 5. What components of the system are most sensitive to withdrawals? Which of these will most likely improve?

#### 6. What are the existing uses (e.g., drinking water), of the source water body?

#### 7. Is there a watershed management plan or objective for the area where the withdrawal is proposed to be made? For the source water? If so, is proposal consistent with the plan?

- What are the existing water quality standards for the source water? For the return water?

#### 8. What is the proposed use of the withdrawn water?

### Category 1: Basic Information on Water Withdrawal

- What are the water use processes?
  - Will its water quality be altered by this use? If so, explain.
  - Will the use be consumptive? If yes, what fraction of withdrawn water is consumed?
  - What is the potential for future changes in the proposed use?
- 9. What is the proposed rate of withdrawal?**
- Will there be seasonal or diurnal variations in withdrawal rate? If so, describe.
  - What is the anticipated duration of this withdrawal? Will the diversion be essentially irreversible?
  - Is an increase in water withdrawal anticipated in the future?
- 10. Where is the unconsumed water proposed to be returned?**
- Will the water be impounded before being returned? If so, describe.
  - Will it be treated before it is returned? If so, describe treatment.
  - If in same water body, where is return located with respect to withdrawal?
  - If different water body, what is the location of the water return?
  - What is the quality of the receiving water for the return?
  - Are there endangered or threatened species or fragile habitats associated with the receiving water? If so, describe.
  - What are the existing uses of the receiving water for the return?
- 11. What will be the physical structure and operation of the proposed water withdrawal and return?** Describe the intake structure and operational plan in detail.
- Will there be any physical, chemical, or biological impacts due to the withdrawal operation? Describe in detail and include entrainment or impingement effects.
- 12. Are other options to this proposed withdrawal available? Can the location of the proposed withdrawal be changed to minimize the impact?** If so, describe the impacts that are associated with these alternatives.

### Category 2: Water Quantity

Questions in this category relate to flows, water levels, groundwater yields, and other information about water quantity in the source and the receiving water.

- 1. For the source water, receiving water for returns, and any other impacted waterbodies (including bypassed reaches, downstream waterbodies and impacted wetlands), does the withdrawal affect:** If yes to any of the questions, describe the impacts.
- |   |   |
|---|---|
| • Baseflow?   | • High water mark? Stream status (permanent or intermittent)? |
| • Range and timing of water levels or water table elevation fluctuations (including seasonal ranges or fluctuations)? | • Index?  |
| • Flows and flow variability?   | • Recession (rate of recharge)?                               |
- 2. How large is the proposed water withdrawal in the context of total system flows in the source water and the receiving water?**
- 3. If there are impoundments, will there be a reduction in peak flows?**
- Will there be a loss in variation of water levels? If yes, describe the impacts.
- 4. For groundwater withdrawals:**
- How important is groundwater seepage in the overall water budget and water characteristics of hydrologically-connected surface waterbodies (e.g., baseflows, water temperature)?
  - Will there be a reduction in the amount of groundwater exchange with the river? Or timing of? Explain.
  - Will there be an effect on any drinking water wells? If yes, explain.

### Category 3: Sediment Dynamics and Characteristics

Questions in Category 3 relate to potential changes in sediment suspension and distribution, or sediment characteristics as a result of the water withdrawal.

- 1. Will there be a change in sediment suspension and distribution (i.e., erosion, accretion/deposition, turbidity) in the source water or the return water?**
  - What is the anticipated magnitude and extent of this impact?
  - Will this alter the shoreline geomorphic features or the location and area of shallow water zones? In what way?
  - Will this change result in the need for increased dredging? Explain.
  - If there are impoundments, will there be a reduction in total sediment delivery? Explain.
  - Will there be significant effects on dynamic beach/coastal processes? Explain.
- 2. Will the water withdrawal affect wave energy dynamics?** If yes, describe the effects.
- 3. Will there be a change in sediment characteristics in the source water or the return water?**
  - Will there be an increased sediment contamination by persistent toxic substances?
  - Will there be a change in the properties of suspended or bedded sediments?
  - Will there be an alteration of the organic carbon content of sediments?
  - Will there be an increased sediment oxygen demand?

### Category 4: Water Quality

The following questions relate to the quality of the source and receiving water, including any potential impacts related to invasive species.

- 1. How will the withdrawal alter the water quality of the source water and the return water?**  
**Address changes in:**

|                            |                               |
|----------------------------|-------------------------------|
| • Temperature              | • Nitrates                    |
| • Dissolved oxygen         | • Buffering capacity          |
| • BOD                      | • Salinity                    |
| • Total dissolved solids   | • Sulfur                      |
| • Pathogens                | • Water conductivity          |
| • Dissolved organic carbon | • Persistent Toxic Substances |
| • Nutrients                |                               |
- 2. Are there invasive species in the source water or return water? Please list.**
  - How are invasive species in the source water affected (negative and positive impacts)?
  - What pathways, if any, will be created by the withdrawal/diversion that would allow invasive species to spread?
- 3. Will the water use (e.g., irrigation) lead to degradation of unrelated water supplies (e.g., groundwater)?** Explain.
- 4. Will there be alteration of the thermal profile in the source or receiving water?** Explain.  
If there are impoundments, will there be an increase in water temperature? Explain.

### Category 5: Ecological Impacts

Questions in Category 5 relate to potential impacts on habitats, structure and function of the ecosystem, and any ecological benefits that may occur as a result of the proposed activity.

- 1. For the source and return systems, will the changes in water quantity, sediment dynamics, and/or water quality:**  
*affect aquatic or terrestrial habitats?*
  - Will there be habitat loss or gain?
  - Which species habitats are impacted (fish, benthos, birds, amphibians, reptiles, mammals, invertebrates)? Will any sensitive species such as piping plover be impacted?
  - What are the habitat attributes that are impacted? For example, for migratory species, will access

### Category 5: Ecological Impacts

or connectivity be affected? Will resiliency of the habitat be affected?  
*affect production or diversity of flora (including phytoplankton, periphyton, and macrophytes)?*  
*cause acute or chronic toxicity to any species?*  
*affect population levels or growth rates of any species in impacted system?*  
*affect hypereic zone and subsequently affect surface aquatic systems?*  
*have an ecological impact on assemblages of endangered/threatened species?*

Describe any changes in detail. Include consideration of any seasonal pattern of withdrawals, and the related effects on impacted species (e.g., access to fish spawning areas in the spring).

**2. For the source and return systems, will the changes in water quantity, sediment dynamics, and/or water quality:**

*affect predator-prey relationships or food web structure and/or function in the impacted system?*

- If yes, which species are impacted?
- If yes, how will the whole community structure and function be impacted?

*cause a change in the energy flow or nutrient cycling through the ecosystem?*

*cause an increased bioaccumulation of contaminants in the food web? Lead to human health impacts through increased contaminant levels in fish or other pathways?*

Describe any changes in detail

**3. What ecological benefits, if any, will accrue from the proposed water withdrawal or diversion?**

**4. Will the withdrawal change the amount or the functioning of riparian land? Describe any changes.**

### Category 6: Cumulative Impacts

The questions in Category 6 address the potential for cumulative impacts as a result of the proposed use and other existing and future uses of the water. Questions also address whether there are any features (such as land use) that may alter the impact of the proposed activity.

**1. From a lake-wide, river, connecting channel, and/or system-wide basis, how will this withdrawal (and return flow if applicable) affect:**

- water levels and flows?
- water quality and ecological health of the source water?
- water quality and ecological health of the receiving water for the return?

**2. Will this withdrawal (and return flow if applicable), when combined with ongoing and anticipated future withdrawals, cause a deviation from the hydrology/hydraulics of the system that is required to maintain the health and integrity of the ecosystem? In what way?**

**3. Will changes in the hydrology/hydraulics of the Great Lakes-St. Lawrence system that may result from global climate changes alter the impact of the water withdrawal? In what way?**

**4. Can further impacts be anticipated in the long-term on such things as land-use or population, as a result of the project?**

**5. Are there any existing or potential features that would alter the impact of the water withdrawal (channel/lake structures, channel lake substrate, existing land use, water control structures, conservation)? If so, describe.**

## Federal and Regional Agencies Involved in Great Lakes Data Collection

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The following table presents the federal and regional agencies in the Great Lakes-St. Lawrence River region involved in the science, management and/or policy of the chemical, biological, or physical nature of Great Lakes issues. The federal agencies listed include:

- U.S. Geological Survey
- National Park Service
- U.S. Fish and Wildlife Service
- National Oceanic Atmospheric Administration
- U. S. Forest Service
- National Resources Conservation Service
- U.S. Army Corps of Engineers
- U.S. Coast Guard
- U.S. Environmental Protection Agency
- National Aeronautics and Space Administration

The regional or multi-agency organizations include:

- NatureServe
- National Biological Information Infrastructure
- National Snow and Ice Data Center
- National Ice Center
- Great Lakes Fisheries Commission